The paper contains an analysis of these salts.

The mosses and lichens were also found to yield fucusol. The ferns, on the other hand, yield a peculiar oil, which differs both from fucusol and furfurol, possessing properties intermediate between them.

The results of these experiments seem to indicate some curious botanical relations, as it appears highly probable that the *matière incrustante* is the same in all phanerogamous plants as they yield furfurol. On the other hand, the *matière incrustante* in the Algæ, mosses and lichens, as it yields fucusol and not furfurol, though the same in each of these classes, is evidently different from that of phanerogamous plants. The *matière incrustante* of ferns appears however to be dissimilar from either of the others, as it yields an analogous but peculiar oil.

April 25, 1850.

The EARL OF ROSSE, President, in the Chair.

M. Quetelet was admitted into the Society.

The following papers were read:—

1. "On the Temperature of Steam and its corresponding Pressure." By John Curr, Esq. Communicated by J. Scott Russell, Esq., F.R.S.

The author states that it is intended in this paper to propose a simple law to determine the pressure of steam corresponding to any given temperature, *irrespectively of experiment*, taking as the sole datum, that the vaporizing point of water under a given pressure is 100 degrees, that number being taken to correspond with the scale of Celsius; also to construct formulæ in accordance therewith; and afterwards to compare their results with the actual experiments of the Academy of Sciences of Paris. He further states that the rationale of the subsequent formulæ is expressed as follows. Let it be conceived that a *given* quantity of water is vaporized under the condition that the pressure thereon is increased in the same ratio that the volume is increased, or that at intervals of temperature 1, 2, 3, &c. the volume is increased the same or in equal proportions; the temperature of the volume will be increased exactly as the square of the temperature indicated by the thermometer, supposing the instrument to be a true measure of temperature, and as the square of the volume; and the same of the pressure.

Steam being generated from an *indefinite* quantity of water and confined within a limited space, as in the usual boiler, he considers the foregoing case is reversed; for the volume being constant, the action of the fire is entirely exerted in producing increased elastic tension of the vapour; therefore the temperature of the steam at the interval 1 to 2 degrees is increased inversely in the duplicate ratio of the ratio in the case first described; that is, the pressure is increased directly at the square of the square, or fourth power of the

temperature; whence the following law. The pressure of steam generated in the usual steam-boiler is directly proportional to the fourth power of its temperature, when measured by a true scale.

It being assumed that 100 degrees is the temperature of steam when its pressure is in equilibrium with a column of 30 inches of mercury, or with the pressure of one atmosphere, then F being the pressure in atmospheres, at any temperature t,

$$F=\left(\frac{t}{100}\right)^4.$$

A comparison is instituted between theoretic experiments of the Academy of Sciences and the results of this formula, from which it appears that the temperatures deduced from the formula are invariably in defect, the greatest difference being 3·51, and the least 2·02.

2. "On the means adopted in the British Colonial Magnetic Observatories for determining the absolute values, secular change, and annual variation of the Magnetic Force." By Lieut.-Col. Edward Sabine, R.A., For. Sec. R.S.

The determination of the mean numerical values of the elements of terrestrial magnetism in direction and force at different points of the earth's surface (the force being expressed in absolute measure, intelligible consequently to future generations, however distant, and conveying to them a knowledge of the present magnetic state of the globe), and the determination of the nature and amount of the secular changes which the elements are at present undergoing, are, as the author states, the first steps in that great inductive inquiry by which it may be hoped that the inhabitants of the globe may at some date, perhaps not very distant, obtain a complete knowledge of the laws of the phenomena of terrestrial magnetism, and possibly gain an insight into the physical causes of one of the most remarkable forces by which our planet is affected.

After stating the inadequacy of the instruments originally proposed by the Royal Society, to the attainment of all the objects for which they had been designed, the author refers to the modifications which had been introduced, in the instruments and methods of observation for the determination of the absolute values, and the secular changes of the horizontal component of the magnetic force. He then gives the series of the results of the monthly observations at Toronto from January 1845 to April 1849 as relatively correct; and from this series, regarding each monthly determination as entitled to equal weight, and taking the arithmetical mean of all the values as the most probable mean value, obtains 3·53043 as the mean value of the horizontal force at Toronto, with a probable error of $\pm$·00055; and the probable error of $\pm$·0040 for each monthly determination.

This is on the most simple hypothesis, in which neither secular change nor annual variation is supposed to exist. The monthly results however distinctly indicate a secular change, and by means of them, on the hypothesis of a uniform secular change, the author